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Risk assessment of debris flow disaster in Songhe village in Taiwan

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Concept of the risk management has been popular on the field of natural hazard mitigation in the world. In order to understand the distribution of risk around the potential debris flow areas, this study established a model for assessing risk of debris flow disaster. The definition of risk herein is based on the concept from the International Strategy Disaster Reduction (ISDR). Risk is an interaction of the hazard, vulnerability and capacity, which indicates a close connection with humans' activities. Therefore, risk could be expressed by the function of hazard, vulnerability and capacity.

According to the foregoing function, the risk degree of this study was calculated by multiplying hazard grade, the value of vulnerability and the normalizing index of capacity. Firstly, we used Flo-2D software to simulate the submerged areas under different sized rainfall events with 10 and 150 year return period respectively. By dividing the submerged depth of debris flow into two classes, we can get two levels of intensity for debris flow. Resulting from combination of different levels of intensity and probability, the areas which are endangered by debris flow could be classified into two hazard rating zones, i.e. red and yellow zone. Each kind of elements at risk has distinct susceptibility factors, which represent the ratio of actual loss to total value of element, in the two zones.

Secondly, we used land-use layer covering the layer of submerged areas to get the distribution of vulnerability. The original elements were reclassified into six groups, i.e. house, farming land, forest land, road, bridge and others. The mean value of an element in each group is based on the price bulletining from the local authorities. Thirdly, the Analytic Hierarchy Process (AHP) was used to establish the framework

and evaluate the resilient capacity of the village, which included the ability of residents to resist natural hazard and the village resource for preventing from disasters. The former was evaluated by a questionnaire to residents living in the range of potential debris flow areas, and the latter was evaluated by check list to village heads. A questionnaire to professionals was used to calculate the weighting of each item. Therefore, the total score of capacity could be evaluated with the weightings and be transformed into a normalizing index. Finally, by multiplying three terms mentioned above, the risk degree could be computed. Then the risk map could be obtained in the absence or installation of mitigation measures.